I claim:

1. A grating scale measurement system comprising:

a telephoto lens positioned to form an image of a grating, wherein the telephoto lens comprises a plurality of aspheric lenses; and

a detector positioned to measure movement of an intensity distribution in an image plane of the telephoto lens.

2. The system of claim 1, wherein the telephoto lens comprises:

a first aspheric lens and a second aspheric lens positioned to form a subsystem that operates at finite conjugates; and

a magnifying system positioned to magnify an image of the subsystem.

3. The system of claim 2, wherein the magnifying system comprises a first negative lens, which has a negative focal length.

4. The system of claim 3, where in the magnifying system further comprises a second negative lens, which has a negative focal length.

5. The system of claim 2, wherein the first and second aspheric lenses are substantially identical.

6. The system of claim 2, wherein:

the first aspheric lens is positioned so that an object is at a focal point of the first aspheric lens; and

the second aspheric lens is positioned so that an image of the first aspheric lens is an object of the second aspheric lens.

7. The system of claim 6, wherein the first and second aspheric lenses are substantially identical.

8. The system of claim 2, wherein the subsystem including the first and second

aspheric lenses provides unit magnification.

9. A telephoto lens comprising:

a first aspheric lens and a second aspheric lens positioned to form a subsystem that operates at finite conjugates; and

a magnifying system positioned to magnify an image of the subsystem.

10. The lens of claim 9, wherein the magnifying system comprises a first negative lens, which has a negative focal length.

11. The lens of claim 10, where in the magnifying system further comprises a second negative lens, which has a negative focal length.

12. The lens of claim 9, wherein the first and second aspheric lenses are substantially identical.

13. The lens of claim 9, wherein:

the first aspheric lens is positioned so that an object is at a focal point of the first aspheric lens; and

the second aspheric lens is positioned so that an image of the first aspheric lens is an object of the second aspheric lens.

14. The lens of claim 13, wherein the first and second aspheric lenses are substantially identical.

15. The lens of claim 9, wherein the first and second aspheric lenses for a subsystem of unit magnification.